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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/530,730	09/29/2005	Yoshimi Shioya	SHIO3005/GAL	4310

7590 03/02/2007

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EXAMINER	
DEO, DUY VU NGUYEN	
ART UNIT	PAPER NUMBER
1765	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/02/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

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Office Action Summary	Application No.	Applicant(s)	
	10/530,730	SHIOYA ET AL.	
	Examiner	Art Unit	
	Duy-Vu N. Deo	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 April 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *34-53* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *34,37-39,42-44 and 46-53* is/are rejected.

7)☒ Claim(s) *35,36,40,41 and 45* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 April 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5/3/05;* .
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 44, 46-49 are rejected under 35 U.S.C. 102(b) as being anticipated by Cheung et al. (US 6,303,523).

Cheung describes a method for depositing a low k dielectric layer having improved moisture barrier properties (col. 5, line 25-28) comprising the steps of: generating a film forming gases including dimethylsilane (claimed silicon-contained organic compound), hexamethyldisiloxane (claimed silicon-contained organic compound having a siloxane bond) (col. 3, line 50-55; col. 5, line 41, 59; col. 7, line 30-36), in addition N2 (col. 14, line 14) and H2O at flow rate ratio to the silicon-contained organic compound of 12 or more (col.6, line 10-14; col. 14, line 10-14); applying a power at high RF frequency of 13.56 MHz to the gases and a bias of 360 KHz (col. 9, line 1-5) and a pressure of 0.2-20 Torr (col. 14, line 17) to generate a plasma so as to form a low-k insulating film on the substrate whose temperature would be raised; annealing the low-k layer at temperature about 400 degrees Celsius (col. 7, line 46-50).

Referring to claim 48, the method further comprising compounds include –C-H bonds or CHF compounds (col. 5, line 25-35; col. 6, line 35-49).

Referring to claim 49, the wirings comprises of Cu (col. 16, line 32-35).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cheung and further in view of Xu et al. (US 6,656,837).

Referring to claim 39, Cheung doesn't describe the annealing in an atmosphere of nitrogen or inert gas. Xu teaches a step of annealing the deposited low k layer where in inert gases can be added to the annealing atmosphere (col. 7, line 50-55). One skilled in the art would find it obvious to add inert gas because it has been successfully used in annealing the layer to prevent shrinkage or deformation of the layer as taught by Xu (col. 7, line 50-55).

5. Claims 34, 37, 38, 42, 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cheung and further in view of Lee et al. (US 2005/0042889).

Referring to claim 34, Cheung doesn't describe the step of bringing the low-k film into contact with a plasma that is generated from He, Ar, H2 or deuterium. Lee teaches to anneal the dielectric layer using a plasma anneal process having Ar, H2 or He (paragraphs 0103, 0104). One skilled in the art would find it obvious to anneal the

dielectric layer using a plasma having He, or H2 because it has been successfully used in annealing the layer to prevent shrinkage or deformation of the layer as taught by Lee (paragraph 0103).

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 37, 42, 44, 46, 48, 50, 52 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Referring to claims 37, 42, 48, 52, it is not clear what it is meant by the limitation CxHyFz or CxHyBz (x,y are 0 (where, except the case x=y=0) or a positive integer, z is a positive integer).

Referring to claim 44, it is not clear by the limitation "...forming a barrier insulating film on the substrate whose temperature is raised".

Referring to claims 46 and 50, the limitation "...while at least the power of the frequency of 1MHz or more out of the power of the frequency below 1 MHz..." is vague.

8. Claim 50 recites the limitation "the barrier insulating film". There is insufficient antecedent basis for this limitation in the claim.

Claim Objections

9. Claims 37, 38, 42, 43 are objected to because of the following informalities: claim 37 is the same as 42 and they both depend on the same claim 34. It is the same for claims 38 and 43. Appropriate correction is required.

Allowable Subject Matter

10. Claims 35, 36, 40, 41, 45 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 35, 36, 40, and 41 are allowable because applied prior art doesn't teach or suggest the step of annealing the low-dielectric insulating film is followed b the further step of removing a surface layer of the low-dielectric insulating film.

Claim 45 is allowable because applied prior art doesn't teach suggest in the step of forming the barrier insulating film, a power of a frequency of below 1 MHz is applied to the substrate to bias the substrate and to generate a plasma of the film forming gas by the power of the frequency of below 1 MHz so as to react it, and thus the barrier insulating film is formed.

11. Claims 50-53 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.

Claims 50-53 are allowable because applied prior art doesn't teach or suggest applying a power of a frequency of below 1 MHz to the substrate to bias the substrate and to generate a plasma of the film forming gas by the power of the frequency of below 1 MHz so as to react the plasma, and thus forming a first insulating film.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Duy-Vu N. Deo whose telephone number is 571-272-1462. The examiner can normally be reached on Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Duy-Vu N Deo
Primary Examiner
Art Unit 1765

2/28/07